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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/904,919 | 07/13/2001 | Michael E. Mack | 11460-112 | 4702 |

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| EXAMINER | |
|---|---|
| NGUYEN, LAM S | |
| **ART UNIT** | **PAPER NUMBER** |
| 2853 | |

DATE MAILED: 01/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/904,919 | MACK ET AL. | |
| | Examiner | Art Unit | |
| | LAM S NGUYEN | 2853 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *01 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *25-30 and 32-35* is/are allowed.

6)☒ Claim(s) *1-3,6,9-15,18 and 21-24* is/are rejected.

7)☒ Claim(s) *4,5,7,8,16,17,19,20 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Objections*

Claim 31 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 31 contains limitation "taking a derivative of the current transient after time $t_0$" cited in the parent claim 25.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-3, 6, 9-15, 18, 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bakker (US 634683) in view of Haberland (US 5110435).

Bakker discloses a time-of-slight mass spectrometer, comprising:

an accelerator for accelerating an ion beam along a trajectory (FIG. 1, elements a1-a3);

a beam gate for controllably interrupting and restoring the ion beam (FIG. 2, element s1);

beam current measurement means (Column 7, line 19-20) disposed along the trajectory at a predetermined distance, L (FIG. 2, element L), from said beam gate;

control means for providing beam gating/deflecting signals to said beam

gate/deflector that controllably interrupt and restore the ion beam (FIG. 1: a corresponding control means for controlling the deflection of element s1);

time-of-flight measurement means for measuring the times-of-flight of components of the ion beam over said distance, L (column 7, line 14-22 and FIG. 2, element L); and a time-of-flight analyzer to analyze said times of flight of components of the ion beam in order to provide output information relative to mass or size (column 7, line 14-22).

**Referring to claims 2, 14:** further comprising display means for displaying the times-of-flight of components of the ion beam (FIG. 1, element 6).

**Referring to claim 3:** wherein the time-of-flight analyzer calculates the size or mass distribution of components of the ion beam (column 7, line 14-21), and the apparatus further comprises display means for displaying the size or mass distribution of the components of the gas cluster ion beam (FIG. 1, element 6).

**Referring to claims 6, 15, 18:** wherein the time-of-flight analyzer calculates the size-to-charge-ratio distribution of components of the ion beam, and the apparatus further comprises display means for displaying the mass-to-charge-ratio of the components of the ion beam (column 7, line 14-22).

**Referring to claims 9, 21:** wherein the beam current measuring means comprises a faraday cup for collecting beam current signals (FIG. 1, the element covers elements 23-26).

**Referring to claims 10, 22:** wherein the accelerator accelerates the ion beam to a known energy in the range of from about 1 keV to about 50 keV (FIG. 1,element 10: 3.5 keV).

**Referring to claims 11, 13:** wherein the beam gate/deflector switches the beam on or off or from the first trajectory to the second trajectory during a time that is shorter than the time-of-flight of the ion beam particles of mean mass as they travel said distance, L (FIG. 2).

Bakker does not disclose an apparatus for gas cluster ion beam (GCIB) processing including mass or cluster size diagnostics for improving GCIB workpiece processing comprising a vacuum vessel, a gas cluster ion beam source within the vacuum vessel for producing a gas cluster ion beam, and workpiece holding means disposed along the trajectory for holding a workpiece for gas cluster ion beam processing.

Haberland discloses an apparatus for gas cluster ion beam (GCIB) processing is developed from a high resolution time-of-flight mass spectrometer to experimentally investigate the cluster size distribution (Abstract). The apparatus comprises a vacuum vessel (FIG. 1, element 5), a gas cluster ion beam source within the vacuum vessel for producing a gas cluster ion beam (FIG. 1, element 1), and workpiece holding means disposed along the trajectory for holding a workpiece for gas cluster ion beam processing (FIG. 1, element 25).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to develop the time-of-slight mass spectrometer disclosed by Bakker such that comprising a vacuum vessel, a gas cluster ion beam source, and workpiece holding means for holding a workpiece for gas cluster ion beam processing instead of ion beam processing as disclosed by Haberland. The motivation of doing so is to obtain an apparatus for gas cluster ion beam (GCIB) processing that is able to experimentally investigate the cluster size distribution as taught by Haberland (Abstract).

***Allowable Subject Matter***

2. Claims 25-30, 32-35 are allowed and claims 4-5, 7-8, 16-17, 19-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

**Referring to claims 4, 7, 16, and 19:** The most pertinent art fails to disclose wherein the time-of-flight analyzer calculates the size or mass distribution by analyzing the beam current fall-off characteristics when the gas cluster ion beam is interrupted. Therefore, the claimed invention is not disclosed by the cited prior art.

**Referring to claims 5, 8, 17, and 20:** The most pertinent art fails to disclose wherein the time-of-flight analyzer calculates the size or mass distribution by analyzing the beam current rise characteristics when the gas cluster ion beam is restored. Therefore, the claimed invention is not disclosed by the cited prior art.

**Referring to claim 25:** The most pertinent art fails to disclose wherein the processing step further comprises the steps of taking a derivative of the current transient after time to. Therefore, the claimed invention is not disclosed by the cited prior art.

Claims 26-30 and 32-35 are allowed because they depend directly/indirectly on claim 25.

***Response to Arguments***

Applicant's arguments with respect to claims 1, 12, 23-24 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (703)305-3342. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D MEIER can be reached on (703)308-4896. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

LN
December 28, 2003

HAI PHAM
PRIMARY EXAMINER